

MULTIMEDIA



UNIVERSITY

STUDENT ID NO

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MULTIMEDIA UNIVERSITY

FINAL EXAMINATION

TRIMESTER 3, 2016/2017

PMT0101 – MATHEMATICS I

(All sections / Groups)

26 MAY 2017

3:00 p.m. – 5:00 p.m.

(2 Hours)

INSTRUCTIONS TO STUDENT

1. This question paper consists of six pages with **FIVE** questions.
2. Attempt **ALL** questions. All questions carry equal marks and the distribution of the marks for each question is given.
3. Please write all your answers in the answer booklet provided.
4. No calculators are allowed.
5. You are required to write proper steps.

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QUESTION 1 [10 marks]

- (a) Simplify the expression and write your final expression as a fraction with no negative exponents. Assume all variables have nonzero values.

$$\left(\frac{-2xy^{-2}}{y^3}\right)^2 \cdot \left(\frac{x^{-4}}{4y^2}\right) \quad [2 \text{ marks}]$$

- (b) Rationalize the denominator for $\frac{1-\sqrt{5}}{1+2\sqrt{5}}$ and simplify. [2 marks]

- (c) Simplify the following expression and write your final expression as a single term. Assume all variables have positive values.

$$-3y\sqrt{\frac{4x^2}{3}} + 2\sqrt{3x^2y^2} \quad [2 \text{ marks}]$$

- (d) Factor the polynomial completely.

$$5xy^2 - 7xy - 6x \quad [2 \text{ marks}]$$

- (e) Express $\frac{3+2i}{2-3i}$ in the form $a+bi$, where a and b are real numbers. [2 marks]

Continued

QUESTION 2 [10 marks]

- (a) Factor $x^3 - x^2 - 4x + 4$ completely.

Then use your result to solve the following equation.

$$x^3 - x^2 - 4x + 4 = 0 \quad [2.5 \text{ marks}]$$

- (b) Solve the equation $x - 4 = \sqrt{3x - 8}$. Remember to check your answers.

[3 marks]

- (c) Solve $1 \leq \frac{2x-1}{-3} \leq 5$. Give your final answer in interval notation.

[2 marks]

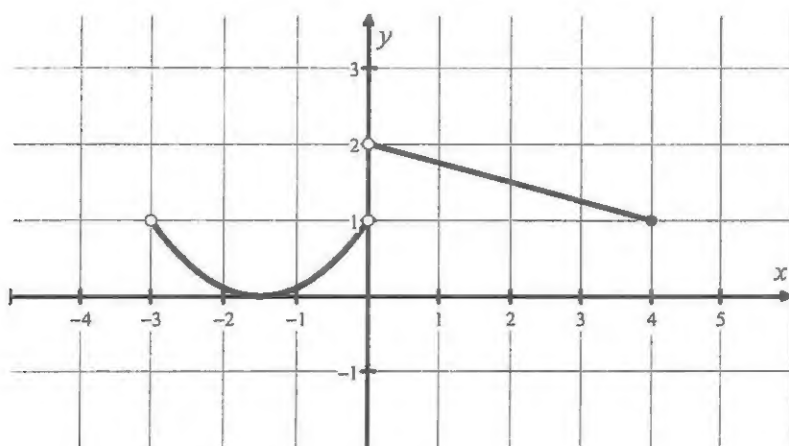
- (d) Solve the equation $|4x - 3| = 13$

[2.5 marks]

Continued

QUESTION 3 [10 marks]

- (a) The figure shows the graph of a function.
(The axes are marked off in one-unit intervals.)



- (i) State the domain and the range of the function in interval notation.
 (ii) State whether it is a one-to-one function.

[2 marks]

- (b) Given the functions $f(x) = \sqrt{3+x}$ and $g(x) = \frac{6}{4x+1}$, find

- (i) $(f \circ g)(6)$, giving your final answer in the form $\frac{m}{n}$ where m and n are integers.
 (ii) $f^{-1}(x)$, as a polynomial in x .

[3 marks]

- (c) Given a polynomial function $f(x) = 2x^3(x-4)^2(x+1)$.

- (i) What is the degree of f ?
 (ii) Find the zeros of f and their multiplicities.
 At each zero, determine whether the graph of f crosses or touches the x -axis.
 (iii) Find the y -intercept of the graph of f .
 (iv) Determine the end behavior of f .
 (v) Sketch the graph of the function f .

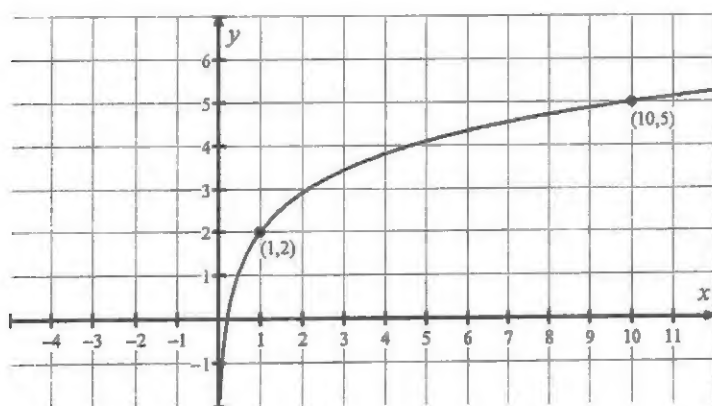
Make sure your graph shows all intercepts and exhibits the proper end behaviour.

[5 marks]

Continued

QUESTION 4 [10 marks]

- (a) Use long division to find the quotient and the remainder when the polynomial $3x^3 - 2x^2 + 10x - 7$ is divided by $x^2 + 3$.
You are required to state clearly what the quotient and the remainder are. [3 marks]
- (b) Solve the equation $8^{3x-1} = 4^{2x+3}$. [2 marks]
- (c) Given $h(x) = -2\left(\frac{1}{3}\right)^x + 1$.
Find the value of m such that $h(m) = 53$. [1 mark]
- (d) Express the following expression as a single natural number. Show proper steps.
 $2\log_{10} 5 + \log_{10} 12 - \log_{10} 3$ [2 marks]
- (e) The graph of $y = a + k \log_{10} x$ passes through points (1, 2) and (10, 5).



Find the values of a and k .

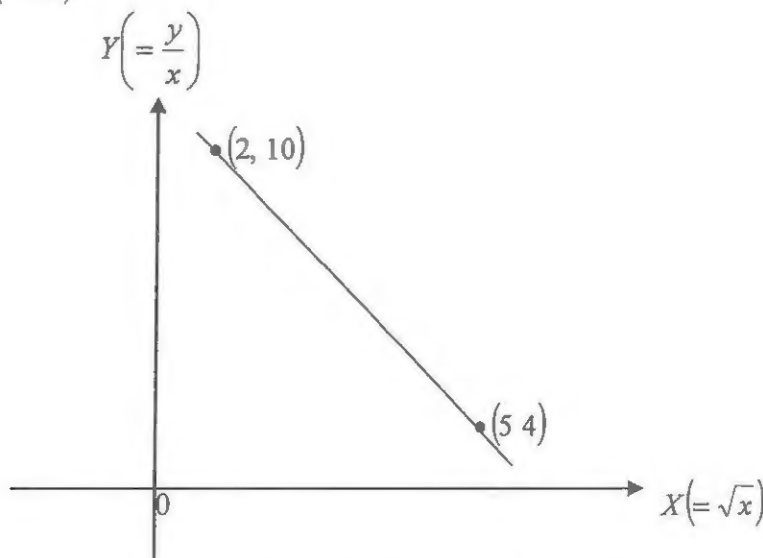
[2 marks]

Continued

QUESTION 5 [10 marks]

- (a) Given an equation of a circle $x^2 - 4x + y^2 + 8y - 5 = 0$.
- (i) Express the equation in the form $(x - h)^2 + (y - k)^2 = r^2$ where h , k and r are constants.
- (ii) Find the centre and radius of the circle. [2.5 marks]
- (b) Find an equation of a line that contains the point $(-1, 2)$ and is perpendicular to the line $x + 3y = 6$.
Write your final answer in the form $y = mx + b$. [2.5 marks]
- (c) Find an equation of the locus of a moving point $P(x, y)$ which is always equidistant from points $A(-2, 3)$ and $B(4, -1)$. [2 marks]
- (d) Two variables x and y are related by an equation $y = px + qx^{\frac{3}{2}}$, where p and q are constants.

The diagram below shows part of a straight line obtained by plotting $Y\left(=\frac{y}{x}\right)$ against $X(=\sqrt{x})$.



- (i) Rewrite the given equation to express $\frac{y}{x}$ in terms of \sqrt{x} .
- (ii) Find the values of p and q .

[3 marks]

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